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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

KNOLL, CLIFFORD H

ART UNIT	PAPER NUMBER
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2112

DATE MAILED: 03/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/833,417

Applicant(s)

BROWNING ET AL.

Examiner

Clifford H Knoll

Art Unit

2112

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 31 December 2003.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-30 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_.

**DETAILED ACTION**

***Claim Rejections - 35 USC § 112***

Claim 18 stands rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 18, the recitation of "per-node" and "each node" is unclear because any intended relationship cannot be clearly established.

In view of amended claims, rejection of claims 14 and 19 under 35 USC 112 has been withdrawn.

***Claim Rejections - 35 USC § 101***

In view of amended claims, rejection of claims 14, 18 and 19 under 35 USC 101 has been withdrawn.

***Claim Rejections - 35 USC § 102***

Claims 1-30 stand rejected under 35 U.S.C. 102(e) as being anticipated by McKenney.

The applied reference has a common assignee and inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Regarding claims 1, 11, and 21, McKenney discloses attempting to obtain a lock on the system resource (e.g., col. 8, lines 62-64), associating a hand-off lock with the lock on the system resource if the attempt to obtain the lock is unsuccessful wherein the hand-off lock includes a per-processor spin field for each processor of the system (e.g., col. 24, lines 44-45); obtaining the hand-off lock on the system resource if the attempt to obtain the lock is unsuccessful, where obtaining the hand-off lock includes spinning on a memory location identified by the per-processor spin field for an associated processor (col. 24, lines 46-48, "enqueue another element 620").

Regarding claims 2, 12, and 22, McKenney also discloses the lock is a simple lock (e.g., col. 23, lines 55-57).

Regarding claims 3, 13, and 23, McKenney also discloses the hand-off lock is a krlock (e.g., col. 24, lines 34-38).

Regarding claims 4, 14, and 24, McKenney also discloses attempting to obtain a lock a predetermined number of times before associating a hand-off lock with the lock on the system resources (e.g., col. 23, lines 58-64).

Art Unit: 2112

Regarding claims 5, 15, and 25, McKenney also discloses the hand-off lock is obtained from a pool of hand-off locks (e.g., col. 24, lines 46-48).

Regarding claims 6, 16, and 26, McKenney also discloses associating a hand-off lock includes storing an index of the hand-off lock in a lock word of the lock (e.g., col. 24, lines 49-50, "link the queue element").

Regarding claims 7, 17, and 27, McKenney also discloses if the lock is freed, obtaining the lock (e.g., col. 24, lines 64-66), releasing the hand-off lock (e.g., col. 24, lines 64-66), and handing-off the hand-off lock to a next processor spinning on the hand-off lock (e.g., col. 12, lines 61-63).

Regarding claims 8, 18, and 28, McKenney also discloses the hand-off lock includes a per-node word containing a state of the hand-off lock on each node (e.g., col. 12, lines 49-53).

Regarding claims 9, 19, and 29, McKenney also discloses when the lock is released, the per-node and per-processor spin fields of the hand-off lock are updated to reflect a next processor obtaining the lock (e.g., col. 12, lines 52-53).

Regarding claims 10, 20, and 30, McKenney also discloses one of a SMP, a NUMA, and a ccNUMA system (e.g., col. 5, line 49).

***Response to Arguments***

Applicant's arguments filed December, 31, 2003 have been fully considered but they are not persuasive.

In light of the amendments some of the citations to McKenney have been rearranged supra; however the rejection under McKenney is maintained. Page numbers from the Applicant's argument cited infra are taken from the original footer ("Page xx of 14") rather than from the fax-enumerated pagination.

Regarding claims 1, 11, and 21, Applicant argues that McKenney "does not teach associating a hand-off lock with the lock on the system resource if the attempt to obtain the lock is unsuccessful, wherein the hand-off lock includes a per-processor spin field for each processor of the multiprocessor system" (p. 9); however the citations supra and in the previous Office Action should make clear that McKenney does in fact disclose this. McKenney states his "method automatically increments the number of spinners" (col. 24, lines 41-42) in a node "with one or more processors per node" (col. 1, lines 63-64). Applicant argues further that McKenney does not "teach obtaining the hand-off lock on the system resource if the attempt to obtain the lock on the system resource is unsuccessful..." (p. 9); however, again McKenney does disclose this as supported by citation used in the rejection. Applicant further argues that McKenney citation does not disclose associating and obtaining a hand-off lock if the attempt to obtain the lock is unsuccessful (p. 10); however, the passage, cited in the Applicant's argument from the previous Office Action refers to the "lock [which] is granted to a processing unit at

Art Unit: 2112

another node"; this grant occurs only because the processing unit has associated and obtained a hand-off lock which McKenney refers to as a lock queue; additional explicit details are cited supra. For example, in specific implementation details, McKenney discusses CPU 4 which cannot obtain a lock and therefore "enqueue[s] another element 620". Applicant argues that McKenney discloses a "kernel-level lingering lock scheme or a kernel quad aware locking scheme (kqalock)" (p. 10); however this is consonant with the lock queue function which anticipates the current invention. Although McKenney teaches the advantages of providing preferences for certain hand-off locks (i.e., intranode (within the node) hand-off locks), this does not subvert the use of hand-off locks, particularly those used in other nodes to which the recitation refers.

Applicant further argues that McKenney does not disclose "a memory location dedicated to a particular processor but is merely an entry in a queue for a node, i.e., a group of processors" and further emphasizes the McKenney does not disclose a "memory location reserved for that processor"; however McKenney discloses precisely this. In McKenney a node may consist of one processor (col. 1, lines 63-64) which renders the "entry in a queue for a node" to be just such a "memory location reserved for that processor", contrary to what the Applicant argues. A fortiori, the basis of the Applicant's argument itself posits a distinguishing interpretation that finds no basis in the claims. Claim 1 as amended recites "a memory location identified by the per-processor spin field" which is substantially broader than the limitation argued by the Applicant, which posits a processor performing the method and a strict one-to-one correspondence between the unrecited processor and the field on the basis of a "per-

Art Unit: 2112

processor" qualification. The recitation as it stands covers a "memory location dedicated to a particular processor" but also covers a more general memory location, such as a node memory location which receives from the "multiprocessor system" distinct "per-processor" spins. McKenney teaches just such a memory location, where each processor on a "per-processor" basis adjusts the spin field. There is no recitation to associate "per-processor" with a particular processor, in fact there is no recitation at all as to what element is "attempting", "associating", and "obtaining", other than that the recited method and apparatus be found in "a multiprocessor system", to which environment McKenney is directed. Therefore, even if one uses the overly narrow interpretation used by the Applicant, McKenney teaches the claimed invention in the particular embodiment of a single processor per node, while in fact in the broader interpretation supported by the recitation, McKenney teaches the claimed invention even among processors of the same node. The broader interpretation might be overcome provided supporting recitation is added to the claim, but even with support the narrower interpretation argued by the Applicant is found in the teaching of McKenney's single processor node.

Applicant argues that "McKenney does not teach, suggest, or give any incentive to make the needed changes to reach the presently claimed invention" (p. 11); however, as stated above, no changes to McKenney are needed.

Thus the previous rejections of claims 1, 11, and 21 are maintained supra.

Regarding claims 3, 13, and 23, Applicant argues that "the queue locking scheme of McKenney has nothing to do with a krlock, where a requesting processor



spins on a memory location reserved for that processor until it is handed the krlock by the owner" (p. 12); however, the citation used above should clarify. McKenney teaches a requesting processor, "CPU 4 must enqueue another element 620 into the list" (col. 24, lines 49-50); further, this location is clearly spun as any queue entry is (e.g., col. 24, lines 56-57). If, as Applicant argues, a krlock is "where a requesting processor spins on a memory location reserved for that processor until it is handed the krlock by the owner", then its anticipation by McKenney is clearly supported by the citation. If a narrower interpretation is intended Applicant must positively recite this limitation in the claim, all the more so if this is an essential feature of the invention. Applicant further argues that "[t]here is nothing in this section, or any other section of McKenney, that teaches obtaining a hand-off lock, which is associated with a lock, from a pool of hand-off locks" (p. 12); however, such a pool is readily seen in McKenney's teaching of enqueueing the hand-off lock (col. 24, lines 49-50, and quoted supra).

Thus the previous rejections of claims 3, 13, and 23 are maintained supra.

Regarding claims 7, 17, and 27, Applicant argues that "[t]here is nothing in this section, or any other section of McKenney, that teaches releasing the hand-off lock, which is associated with the lock, and handing-off the hand-off lock to a next processor spinning on the hand-off lock; however McKenney discloses that when a lock is released, the queued element acquires the lock, and in so doing, hands off the hand-off lock because it is no longer spinning for the lock for it has acquired it (e.g., col. 25, lines 20-29). In this particular example, CPU 4 has acquired the lock. In so doing, it has handed off the hand-off lock to a remaining processor, in this case CPU 1. Applicant

has previously stated that McKenney discloses a lingering lock scheme, and in the present example McKenney does disclose the use of a fairness scheme; however, in the case of a single processor per node, supported by McKenney's disclosure, the lingering lock scheme does not even apply to the invention. This observation merely supports the argument that a lingering lock scheme, which is part of McKenney's disclosure is not integral to the teaching used in the rejection and thus does not subvert the teaching of hand-off locks as substantially recited by the Applicant.

Thus the previous rejections of claims 7, 17, and 27 are maintained *supra*.

Regarding claims 8, 18, and 28, Applicant argues that McKenney does not teach "when the lock on the system resource is released, the per-node word and per-processor spin fields of the hand-off lock are updated to reflect a next processor obtaining the lock on the system resource" (p. 13); however McKenney teaches precisely this. Applicant has amended claims to recite similar matter in the parent claim and deleted this matter in the instant claim. This matter has been treated by Examiner *supra* in the context of the parent claim; the remaining recitation of "the per-node word" is treated presently. McKenney clearly teaches nodes and clearly teaches a "per-node word which contains a state of the hand-off lock on each node"; for example, the "header data structure 600 tracks the head and tail of the queue, and points to queue elements for quad 0 and quad 1" (col. 23, lines 50-52). Absent further recitation, "a state" of an element must be interpreted rather broadly; almost any memory location (as in the instant citation) whose contents are affected by the "state of the hand-off lock" certainly reads on the claimed invention. Nor is any delineation between "nodes" and

"processors" recited. Thus "per-node" memory in the instant claims, and "per-processor" entities of the respective parent claim must be interpreted as broadly as reasonable. Arguments that refer to broadly recited nodes and essentially unrecited processors are deemed not persuasive to overcome the rejection under McKenney.

Thus the previous rejections of claims 8, 18, and 28 are maintained supra.

Regarding claims 9, 19, and 29, Applicant argues that McKenney does not teach "when the lock on the system resource is released, the per-node word and per-processor spin fields of the hand-off lock are updated to reflect a next processor obtaining the lock on the system resource" (p. 13); however the "per-node" word and "hand-off lock" identified in the rejection and as expounded supra adequately indicate the anticipatory nature of McKenney.

Regarding remaining claims Applicant argues that "specific feature recited" (p. 13) in these claims distinguish over McKenney; however, the Examiner asserts that the citations of the rejection and their interpretation given supra serve to clearly identify the anticipatory nature of McKenney.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Frank (US 5790851) gives an embodiment similar to the invention; in particular, Frank discloses a hand-off lock (e.g., col. 6, lines 57-60) and per-processor spin field (e.g., col. 7, lines 18-23).

The rejection under 35 USC 102 stands. Applicant's amendment necessitated a new ground of rejection under 25 USC 112 presented in this Office action.

Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Clifford H Knoll whose telephone number is 703-305-8656. The examiner can normally be reached on M-F 0630-1500.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark H Rinehart can be reached on 703-305-4815. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2112

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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